user manual

Hoefer HB1000

Hybridization Oven

um HB1000-IM/Rev.D0/12-12

Hoefer®

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Important Information – English

- If this equipment is used in a manner not specified by Hoefer, Inc. the protection provided by the equipment may be impaired.
- This instrument is designed for indoor laboratory use only.
- Only accessories and parts approved or supplied by Hoefer, Inc. may be used for operating, maintaining, and servicing this product.
- Warning! Because this instrument can develop sufficient voltage and current to produce a lethal shock, care must be exercised in its operation.
- This instrument is designed in accordance with the EN61010-1:2001 electrical safety standard. Nevertheless, it should be used only by properly trained operators. Read this entire manual before using the instrument and use only according to the instructions.
- The instrument must always be used with the earth lead of the power cord correctly grounded to earth at the mains outlet.
- Use only undamaged electrical wire and equipment specific for the voltages you will use. All equipment connected to high voltage should be in accordance with EN61010-1:2001.
- Keep the instrument as dry and clean as possible. Wipe regularly with a soft, damp cloth. Let the instrument dry completely before use.
- Do not operate the instrument in extreme humidity (above 80%). Avoid condensation by letting the unit equilibrate to ambient temperature when taking the instrument from a colder to a warmer environment.
- To permit sufficient cooling, ensure that the vents of the instrument are not covered.

Duležité Informace – Czech

- Pokud by toto zařízení je použito způsobem, který není podle Hoefer, ochrana poskytovaná na základě Inc. zařízení může být narušena.
- Tento nástroj je určen pro vnitřní použití v laboratoři pouze.
- Pouze příslušenství a části schválen, nebo poskytnutých Hoefer, Inc. mohou být použity pro provoz, údržbu, a údržbě tohoto výrobku.
- Pozor! Protože tento nástroj může vyvinout dostatečný napětí a proud, který má vyrábět a smrtiacej šok, péče musí být vykonávána v jeho provoz.
- Tento nástroj je určen v souladu s EN61010-1:2001 elektrické bezpečnostní normy. Přesto, že by měly být použity pouze řádně vyškolený operátorů. Číst celé toto ruční před použitím nástroje a použití pouze v souladu s pokyny.
- Přístroj musí být vždy používají se na výkonu zemi vést šňůra správně zemněny k zemi na síti výústce.
- Využití pouze nepoškozené elektrické dráty a vybavení pro napětí budete používat. Všechna zařízení spojené s vysokým napětím by měla být v souladu s EN61010-1:2001.
- Si ponechá nástroje jako suchý a čistý jako možné. Otřete pravidelně s a měkké, vlhkým hadříkem. Nechť je nástroj nenastavený úplně před použitím.
- Nejsou provozována na nástroj v extrémní vlhkost (nad 80%). Předešlo kondenzaci o pronájmu jednotky na okolní teplotu nechá při přijímání nástroj z chladnější do teplého prostředí.
- Pro umožnění dostatečné chlazení, zajistit, aby otvory nástroje jsou nevztahuje.

Vigtig Information – Danish

- Hvis dette udstyr bruges i en måde ikke specificeret ved Hoefer, Inc. den beskyttelse, som er blevet forsynet af udstyret kan måske svækkes.
- Dette instrument er designet for indendørs laboratoriumbrug bare.
- Bare tilbehør og del godkendede eller forsynede ved Hoefer, Inc. kan måske bruges for drive, funktionsfejl, og betjening dette produkt.
- Advare! Fordi dette instrument kan udvikle tilstrækkelig spænding og strøm at fremstille et dødbringende chok, skal pleje bruges i dets drift.
- Dette instrument er designet i overensstemmelse med EN61010-1:2001 elektrisk sikkerhedstandard. Alligevel, skulle det bruges bare af passende trænede operatører. Læs denne hel håndbog før bruging instrumentet og brug bare i henhold til instruktionerne.
- Instrumentet skal altid bruges med jordblyet af netledningen rigtigt jordede til jord på hovedledningsudløbet.

- Bruger bare uskadt elektrisk tråd og udstyr, som være specifik for spændingerne du vil bruge. Alt udstyr forbundet til høj spænding skulle være i overensstemmelse med EN61010-1:2001.
- Beholder instrumentet så tør og ren som mulig. Tør regulært med et blødt, fugtigt stof. Lad instrumenttørken komplet før brug.
- Driver ikke instrumentet i yderst fugtighed (ovenfor 80%). Undgå kondensation ved lade enheden equilibrate til omgivende temperatur ved tageen instrumentets fra et koldere til et varmere miljø.
- At tillade tilstrækkelig afkøling, forsikrer, at lufthullerne af instrumentet er ikke dækket.

Belangrijke Informatie – Dutch

- Indien deze uitrusting in een manier wordt gebruikt die niet door Hoefer is gespecificeerd, Nv. de bescherming die door de uitrusting is verzorgd kan worden geschaad.
- Dit instrument is voor binnenlaboratoriumgebruik enkel ontworpen.
- Enkel onderdelen en delen keurden goed of leverden door Hoefer, Nv. kan voor het bedienen worden gebruikt, handhavend en onderhouden van dit product.
- Waarschuwend! Omdat dit instrument voldoende spanning en stroom kan ontwikkelen om een dodelijke schok te produceren, moet zorg in zijn operatie worden geoefend.
- Dit instrument is in overeenstemming met de EN61010-1:2001 elektrische veiligheidsstandaard ontworpen. Niettemin zou het enkel door goed getrainde bedieningslieden moeten worden gebruikt. Lees dit volledige handboek voor het gebruik het instrument en gebruik enkel volgens de instructies.
- Het instrument moet altijd met de aardeleiding van het stroomsnoer correct grondde naar aarde aan het hoofdafzetgebied worden gebruikt.
- Gebruik enkel onbeschadigde elektrische draad en uitrustings specifiek voor de spanningen u zult gebruiken. Alle uitrustingen sloten aan aan hoogspanning zou in overeenstemming met EN61010-1:2001 moeten zijn.
- Houd het instrument zo droge en schone zoals mogelijk Bij. Wis regelmatig met een zacht, temper doek. Verhuur het instrument droogt volledig voor het gebruik.
- Bedien niet het instrument in extreme vochtigheid (bovenstaande 80%). Vermijd condensatie door het verhuren van de eenheid in evenwicht brengt naar omgevingstemperatuur wanneer nemen het instrument van een kouder naar een lievere omgeving.
- Om toe te staan voldoende afkoelen, verzeker dat de luchtopeningen van het instrument niet bedekt zijn.

Tärkeää Tietoa – Finnish

- Jos tätä varusteita käytetään tavassa ei määritetty Hoeferille, Inc. suojelu ehkäisty varusteille saattaa olla avuton.
- Tämä väline suunnitellaan sisälaboratoriokäytölle vain.
- Vain lisävarusteet ja osat hyväksyivät tai toimitti Hoeferin oheen, Inc.:ää voi käyttää käyttämiselle, valvoalle, ja servicing tämä tuote.
- Varoittaminen! Koska tämä väline voi kehittää riittävä jännitteen ja virran tuottaa kuolettavan järkytyksen, huolta täytyy harjoittaa toiminnossaan.
- Tämä väline suunnitellaan EN61010-1:2001 sähköturvallisuusstandardin mukaisesti. Silti pitäisi käyttää vain ohi oikeasti koulutetut käyttäjät. Lue tämä kokonainen manuaalinen ennen välinettä ja käyttö vain ohjeiden mukaan.
- Välinettä täytyy käyttää aina valtanuoran maalyijystä perusti oikein maadoittaa sähköverkkoaukossa.
- Käyttää vain undamaged sähkömetallilankaa ja varusteita, täsmällinen jännitteille käyttää. Kaikki varusteet yhdistetty korkeaan jännitteeseen pitäisi olla EN61010-1:2001IN mukaisesti.
- Pitää välineen yhtä kuiva ja puhdas kuin mahdollinen. Pyyhi säännöllisesti pehmeällä, kostealla kankaalla. Anna väline kuivua täysin ennen käyttöä.
- Ei käytä välinettä extreme-ilmankosteudessa (80%)n yläpuolella. Vältä tiivistymistä antamalla yksikön equilibrate ympäröivään lämpötilaan kun ottaminen väline kylmempi lämpimämpään ympäristöön.
- Sallia riittävän jäähdyttäminen, varmistaa että välineen ilmareiät peitetään.

Information Importante – French

- Si cet équipement est utilisé dans une manière pas spécifié par Hoefer, Inc. la protection fourni par l'équipement pourrait être diminuée.
- Cet instrument est conçu pour l'usage de laboratoire intérieur seulement.
- Seulement les accessoires et les parties ont approuvé ou ont fourni par Hoefer, Inc. pourrait être utilisé pour fonctionner, maintenir, et entretenir ce produit.
- Avertissant! Parce que cet instrument peut développer la tension et le courant suffisants pour produire un choc mortel, le soin doit être exercé dans son opération.
- Cet instrument est conformément conçu à l'EN61010-1:2001 norme de sécurité électrique. Néanmoins, il devrait être seulement utilisé par les opérateurs convenablement entraînés. Lire ce manuel entier avant utiliser l'instrument et l'usage seulement selon les instructions.
- L'instrument toujours doit être utilisé avec l'avance de terre du cordon d'alimentation correctement a fondé à la terre à la sortie principale.
- Utiliser le fil et l'équipement électriques seulement intacts spécifiques pour les tensions que vous utiliserez. Tout équipement connecté à haute tension devrait être conformément à EN61010-1:2001.
- Garder l'instrument aussi sec et propre comme possible. Essuyer régulièrement avec un doux, étouffer du tissu. Laisser l'instrument sèche complètement avant l'usage.
- Ne pas fonctionner l'instrument dans l'extrême humidité (au-dessus de 80%). Eviter la condensation en laissant l'equilibrate d'unité à la température ambiante en prenant l'instrument d'un plus froid à un environnement plus chaud.
- Permettre le refroidissement suffisant, garantir que les conduits de l'instrument ne sont pas couverts.

Wichtige Informationen – German

- Wenn diese Ausrüstung gewissermaßen nicht angegeben durch Hoefer, Inc verwendet wird, kann der durch die Ausrüstung zur Verfügung gestellte Schutz verschlechtert werden.
- Dieses Instrument wird für den Innenlaborgebrauch nur dafür entworfen.
- Nur Zusätze und Teile genehmigten oder lieferten durch Hoefer, Inc kann für das Funktionieren, das Aufrechterhalten, und die Wartung dieses Produktes verwendet werden.
- Die Warnung! Weil dieses Instrument genügend Stromspannung und Strom entwickeln kann, um einen tödlichen Stoß zu erzeugen, muss Sorge in seiner Operation ausgeübt werden.
- Dieses Instrument wird in Übereinstimmung mit dem EN61010-1:2001 elektrischen Sicherheitsstandard dafür entworfen. Dennoch sollte es nur von richtig erzogenen Maschinenbedienern verwendet werden. Lesen Sie dieses komplette Handbuch vor dem Verwenden des Instrumentes und verwenden Sie nur gemäß den Instruktionen.
- Das Instrument muss immer mit der Erdleitung der Macht-Schnur richtig niedergelegt zur Erde am Hauptausgang verwendet werden.
- Nur unbeschädigte elektrische Leitung und Ausrüstung spezifisch für die Stromspannungen verwenden, die Sie verwenden werden. Die ganze mit der Hochspannung verbundene Ausrüstung sollte in Übereinstimmung mit EN61010-1:2001 sein.
- Das Instrument ebenso trocken halten und reinigen wie möglich. Wischen Sie regelmäßig mit einem weichen, befeuchten Sie Stoff. Lassen Sie das Instrument trocken völlig vor dem Gebrauch.
- Das Instrument in der äußersten Feuchtigkeit (über 80 %) nicht bedienen. Vermeiden Sie Kondensation, die Einheit equilibrate zur Umgebungstemperatur laßend, wenn Sie das Instrument von einem kälteren bis eine wärmere Umgebung nehmen.
- Um das genügend Abkühlen zu erlauben, stellen Sie sicher, dass die Öffnungen des Instrumentes nicht bedeckt werden.

Informazioni Importanti – Italiano

- Se quest'apparecchiatura è usata in un modo specificato da Hoefer, Inc. la protezione fornito dall'apparecchiatura potrebbe essere indebolita.
- Questo strumento è disegnato per l'uso di laboratorio interno solo.
- Solo gli accessori e le parti hanno approvato o

hanno fornito da Hoefer, Inc. potrebbe essere usato per operare, per mantenere, e per revisionare questo prodotto.

- Avvertendo! Perché questo strumento può sviluppare il voltaggio sufficiente e la corrente di produrre una scossa letale, la cura deve essere esercitata nella sua operazione. Questo strumento è disegnato conformemente all'EN61010-1:2001 la norma di sicurezza elettrica. Tuttavia, dovrebbe essere usato degli operatori solo correttamente addestrati. Leggere questo manuale intero prima di usare lo strumento e l'uso solo secondo le istruzioni.
- Lo strumento deve essere sempre usato col piombo di terra della spina di alimentazione correttamente hanno messo a terra alla terra alla presa di corrente principale.
- Usa il filo metallico e l'apparecchiatura solo intatti elettrici specifici per i voltaggi che lei userà. Tutta l'apparecchiatura collegata all'alto voltaggio dovrebbe essere conformemente a EN61010-1:2001.
- Tiene lo strumento come secco e pulito come possibile. Pulire regolarmente con un morbido, per spegnere il panno. Lasciare lo strumento asciuga completamente prima dell'uso.
- Non opera lo strumento nell'umidità estrema (al di sopra di 80%). Evitare la condensazione lasciando l'unità equilibra alla temperatura ambiente quando portare lo strumento da un più freddo a un ambiente più caldo.
- Di permettere raffreddare sufficiente, assicura che gli sbocchi dello strumento non sono coperti.

Viktig Informasjon – Norwegian

- Hvis dette utstyret blir brukt i en måte ikke spesifisert ved Hoefer, Inc. beskyttelsen som ha blitt git av utstyret kan bli svekket.
- Dette instrumentet er utformet for innendørs laboratoriumbruk bare.
- Bare tilbehør og deler godkjente eller forsynte ved Hoefer, Inc. kan bli brukt for drive, vedlikeholde, og betjene dette produktet.
- Varsler ! Fordi dette instrumentet kan utvikle tilstrekkelig spenning og strøm til å produsere et dødelig sjokk, må bli øvd bekymring i dets drift.
- Dette instrumentet er utformet i samsvar med EN61010-1:2001 elektrisk sikkerhetsstandard. Likevel burde bli brukt det bare av skikkelig utdannede operatører. Les denne hele håndboken før bruking instrumentet og bruken bare gi til instruksjonene.
- Instrumentet må alltid bli brukt med jorden blyet av kraftkabelen som riktig ha blitt jordet til jord på hovedledningen utløp.
- Bruker bare uskadd elektrisk ledningsfremføring og utstyr som er spesifikk for spenningene du vil bruke. All utstyr koplet til høyspenning burde være i samsvar med EN61010-1:2001.
- Beholder instrumentet som tørker og rengjør som mulig. Visk regulært med et mykt, fuktig stoff. La instrumentet tørker komplett før bruk.
- Driver instrumentet i ekstrem fuktighet ikke (ovenfor 80%). Unngå kondensasjon ved å la enheten equilibrate til omgivelsestemperatur ved taen instrumentets fra et kaldere til et varmere miljø.
- Til å tillate tilstrekkelig kjølig, sikrer at ventilasjonsåpningene av instrumentet er ikke dekket.

Wazne Informacje – Polish

- Jeżeli ten sprzęt jest wykorzystywany w sposób nie określone przez Hoefer, Inc. do ochrony przewidzianej przez urządzenie może zostać obniżony.
- Instrument ten jest przeznaczony do użytku w laboratoriach kryty tylko.
- Tylko akcesoriów i części zatwierdzone lub dostarczone przez Hoefer, Inc. mogą być wykorzystane do eksploatacji, utrzymania i obsługi tego produktu.
- Uwaga! Ponieważ ten akt prawny może być rozwinięcie odpowiednich napięcie i bieżących do wyprodukowania śmiertelnego szoku, opiekę musi być wykonywane w działaniu.
- Ten instrument został zaprojektowany zgodnie z tym EN61010-1: 2001 Bezpieczeństwo elektryczne standard. Niemniej jednak, należy stosować jedynie przez odpowiednio przeszkoleni operatorów. Znajdą państwo to cały podręcznika przed zastosowaniem instrumentu i stosować jedynie zgodnie z instrukcjami.
- Instrument musi zawsze być wykorzystane z ziemi doprowadzić do zasilania detonującego właściwie uzasadnione na ziemię w sieci wodociągowej

rynku zbytu.

- Wykorzystanie tylko nieuszkodzona elektrycznych drutów i urządzenia specjalne do napięć zapłacą wykorzystania. Wszystkie urządzenia podłączone do wysokiego napięcia powinny być zgodne z EN61010-1: 2001.
- Kontrolować instrumentu jako suche i czyste jak to możliwe. Wytrzeć regularnie przy pomocy miękkiego wilgotnej szmatki. Niech się instrumentem całkowicie wysuszyć przed użyciem.
- Nie prowadzą do instrumentu w skrajnych wilgotności (powyżej 80%). Zapobiec kondensacji najmu przez jednostkę równoważyć do temperatury pokojowej przy podejmowaniu instrumentu z chłodniejsze w cieplejszych środowiska.
- Aby umożliwić wystarczające chłodzenia, zapewniają, że rozcięcia of the instrument nie objęte ubezpieczeniem.

Informações Importantes – Portuguese

- Se este equipamento é usado numa maneira não especificada por Hoefer, Inc. que a protecção fornecida pelo equipamento pode ser comprometida.
- Este instrumento é projectado para uso de interior de laboratório só. Só acessórios e partes aprovaram ou forneceu por Hoefer, Inc. pode ser usada para operar, manter, e servicing este produto.
- Advertindo! Porque este instrumento pode desenvolver voltagem suficiente e corrente produzir um choque letal, cuidado deve ser exercitado em sua operação.
- Este instrumento é projectado de acordo com o EN61010-1:2001 condição de segurança eléctrica. Não obstante, deve ser usado só por operadores adequadamente treinados. Leia este manual inteiro antes de usar o instrumento e use só de acordo com as instrucções.
- O instrumento sempre deve ser usado com o chumbo de terra do cordão de poder corretamente baseou a terra nos canos saída principais.
- Usa fio eléctrico só intacto e equipamento específico para as voltagens que você usará. Todo equipamento conectado a voltagem alta deve ser de acordo com EN61010-1:2001.
- Mantem o instrumento tão seco e limpo como possível. Limpe regularmente com um pano húmido macio. Deixe o instrumento secar completamente antes de uso.
- Não opera o instrumento em humidade extrema (acima de 80%). Evite condensação deixando o equilibrate de unidade a temperatura ambiental quando tomar o instrumento de um mais frio a um ambiente mais quente.
- Permitir esfriar suficiente, assegura que as aberturas do instrumento não são cobertas.

Información Importante – Spanish

- Si este equipo es utilizado en una manera no especificado por Hoefer, S.a. la protección proporcionado por el equipo puede ser dañada.
- Este instrumento es diseñado para el uso interior del laboratorio sólo. Sólo accesorios y partes aprobaron o suministraron por Hoefer, S.a. puede ser utilizado para operar, para mantener, y para atender a este producto.
- Advirtiendo! Porque este instrumento puede desarrollar voltaje y corriente suficientes para producir un golpe mortal, el cuidado debe ser ejercitado en su operación.
- Este instrumento es diseñado de acuerdo con el EN61010-1:2001 estándar eléctrico de seguridad. No obstante, debe ser utilizado sólo por operarios adecuadamente capacitados. Lea este manual entero antes de utilizar el instrumento y el uso sólo según las instrucciones.
- El instrumento siempre debe ser utilizado con el plomo de la tierra del cable de alimentación molió correctamente a la tierra en la salida de red.
- Utiliza alambre y equipo eléctricos sólo ilesos específicos para los voltajes que usted utilizará. Todo equipo conectado al voltaje alto debe ser de acuerdo con EN61010-1:2001.
- Mantiene el instrumento tan seco y limpio como posible. Enjugue regularmente con un suave, el trapo húmedo. Permita que el instrumento seque completamente antes de uso.
- No opera el instrumento en la humedad extrema (encima de 80%). Evite condensación permitiendo la unidad equilibra a la temperatura ambiente al

tomar el instrumento de un más frío a un ambiente más tibio.

- Permitir refrigeración suficiente, asegure que las aberturas del

Viktig Information – Swedish

- om denna utrustning används i ett sätt som inte har specificeras av Hoefer, Inc. skyddet tillhandahöll vid utrustningen kan skadas.
- Detta instrument formges för inomhuslaboratorium användning bara.
- Bara medhjälpare och delar godkände eller levererade vid Hoefer, Inc. kan användas för fungera, underhålla, och servicing denna produkt.
- varna! Därför att detta instrument kan utveckla tillräcklig spänning och ström att producera en dödlig stöt, måste övas omsorg i dess funktion.
- Detta instrument formges i överensstämmelse med EN61010-1:2001 elektriska säkerheten standarden. Icke desto mindre, bör det användas bara av riktigt utbildade operatörer. Läs denna hela handbok före använda instrumentet och använd bara enligt undervisningarna.
- Instrumentet måste alltid användas med jorden blyet av kraften repet riktigt grounded till jorden på det huvudutloppet.
- Använder bara undamaged elektrisk tråd och utrustning specifik för spänningarna du ska använda. All utrustning kopplats som till hög spänning skulle vara i överensstämmelse med EN61010-1:2001.
- Håller instrumentet då torkar och rengör som möjlig. Torka regelbundet med en mjuk, fuktig trasa. Låt instrumentet torka fullständigt före användningen.
- Fungerar inte instrumentet i extrem fuktighet (över 80%). Undvik kondensering vid låta enheten equilibrate till omgivande temperatur när ta instrumentet från en kallare till en varmare miljö.
- Att tillåta tillräcklig kyla, ser till att hålen av instrumentet inte täcks.

Waste Electrical and Electronic Equipment (WEEE)

English

This symbol indicates that the waste of electrical and electronic equipment must not be disposed as unsorted municipal waste and must be collected separately. Please contact an authorized representative of the manufacturer for information concerning the decommissioning of your equipment.

French

Ce symbole indique que les déchets relatifs à l'équipement électrique et électronique ne doivent pas être jetés comme les ordures ménagères non-triées et doivent être collectés séparément. Contactez un représentant agréé du fabricant pour obtenir des informations sur la mise au rebut de votre équipement.

German

Dieses Symbol kennzeichnet elektrische und elektronische Geräte, die nicht mit dem gewöhnlichen, unsortierten Hausmüll entsorgt werden dürfen, sondern separat behandelt werden müssen. Bitte nehmen Sie Kontakt mit einem autorisierten Beauftragten des Herstellers auf, um Informationen hinsichtlich der Entsorgung Ihres Gerätes zu erhalten.

Italian

Questo simbolo indica che i rifiuti derivanti da apparecchiature elettriche ed elettroniche non devono essere smaltiti come rifiuti municipali indifferenziati e devono invece essere raccolti separatamente. Per informazioni relative alle modalità di smantellamento delle apparecchiature fuori uso, contattare un rappresentante autorizzato del fabbricante.

Spanish

Este símbolo indica que el equipo eléctrico y electrónico no debe tirarse con los desechos domésticos y debe tratarse por separado. Contacte con el representante local del fabricante para obtener más información sobre la forma de desechar el equipo.

Swedish

Denna symbol anger att elektriska och elektroniska utrustningar inte får avyttras som osorterat hushållsavfall och måste samlas in separat. Var god kontakta en auktoriserad tillverkarrepresentant för information angående avyttring av utrustningen.

Introduction

IMPORTANT! Please read these instructions before operating your Hybridization Oven to familiarize yourself with operation procedures.

The Hoefer® HB1000 Hybridization Oven is a cost-effective, high-performance, 10-bottle hybridization oven with state-of-the-art microprocessor temperature and variable speed controls.

The HB1000 Hybridization Oven can be set to operate anywhere from 10 to 18 RPM, enabling consistent saturation of samples, whether it be for washing or hybridizing. Having the ability to remove the bottle holder carousel and replace it with an interchangeable rocker plate enables all hybridization protocols in one reliable benchtop unit. An easily removable protective tray under the carousel allows easy clean up of spilled media.

A touch sensitive keypad and microprocessor provide accurate temperature control from +10 °C over ambient up to 99.9 °C. The keypad is located just below a large LED readout. Once the desired hybridization temperature is entered, the readout displays the current temperature inside the chamber. The chamber environment is calibrated at 68.0 °C; at this temperature, the accuracy is ±0.5 °C. An internal circulating fan assists uniform distribution of heating throughout the chamber.

Two different hybridization bottle sizes are available for use within the hybridizer using the standard bottle holder carousel provided with the unit. The bottle holder carousel can hold up to twenty (20) 35 × 150 mm bottles or ten (10) 35 × 300 mm bottles. In addition, combinations of both size bottles may be used at the same time.

WARNING!

There may be build up of pressure within the hybridization bottles when they are taken from ambient to hybridization temperature. To help in relieving some of this pressure, preheat the solutions and bottles. Also, be sure bottles are opened at the same temperature at which the hybridization was done. Do not allow the bottles to cool before opening.

To assure hybridization bottles remain leakproof and pressure proof, do not hybridize at temperatures above 70 °C. If temperatures above this are used without first relieving the pressure within the bottle, there is a risk that bottles will leak and/or break due to the internal pressure build up.

If the bottles are accidentally taken above 70 °C without relieving the pressure, DO NOT open the hybridizer door. Turn off the hybridizer and allow it to cool before opening the door and checking the contents of the oven. Should the bottles be used above 70 °C, relieve the pressure by unscrewing and re-tightening the cap.

If using radioactive material see Decontamination (page 8).

Specifications

Power requirement:	115 VAC / 60 Hz or 230 VAC / 50
Net weight:	19.5 kg (43 lb)
Temperature:	Ambient + 10 °C to 99.9 °C
Heating element:	1250 watts
Temperature display:	LCD
Rotation speed:	Off, 10 to 18 RPM
Bottle capacity:	Twenty (20) 35 × 150 mm, Ten (10) 35 × 300 mm
Dimensions (w × h × d):	
Exterior	44.5 × 40.6 × 40.6 cm (17.5 × 16 × 16 in)
Interior	35.6 × 27.3 × 27.3 cm (14 × 10.75 × 10.75 in)

Note: Always use an even number of bottles and load bottles at opposite points to balance the wheels of the bottle holder carousel. This prevents excessive wear of the bearings and drive motor.

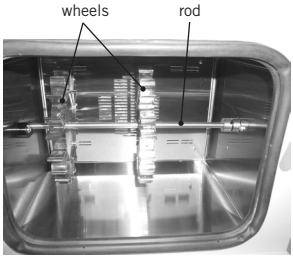


Fig 1. Installing bottle holder carousel.

Fig 2. Adjusting for various bottle lengths.

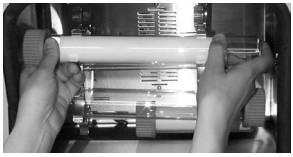


Fig 3. Inserting bottles.

Set-up instructions

Two different bottle sizes are available for use in the hybridization oven. The bottle holder carousel can hold up to twenty (20) 35 × 150 mm bottles or ten (10) 35 × 300 mm bottles. In addition, combinations of both size bottles may be used at the same time.

- To install the bottle holder carousel (Fig 1), slide the bottle wheels (2) onto the rod and tighten the thumb screws. Insert the rod into the holder on the right wall. Slide the rod into the holder on the left wall of the chamber.
- To adjust for various bottle lengths (Fig 2), loosen the thumb screws on the bottle wheels and reposition them along the rod to accommodate the desired bottle length.
- If skewed bottle positioning is required, loosen the thumb screw on only one bottle wheel (Fig 2). Slightly rotate the wheel until the required angle is obtained. Retighten the thumb screw.
- To insert bottles into bottle clips, gently push bottle into the clips (Fig 3).

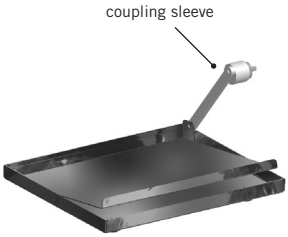


Fig 4. The optional rocker tray.

Installing the optional rocker tray

❶

Remove the bottle holder carousel from the chamber.

❷

Position the rocker tray in the chamber so that the coupling arm is located on the right side.

❸

Place the coupling sleeve over the motor drive shaft so that the pins on the inside of the coupling sleeve engage the slots in the motor drive shaft of the chamber.

❹

Rotate the sleeve counter-clockwise 30° until locked into place.

❺

To remove the tray, reverse the process.

Operating instructions

Using the Hybridization Oven

❶

Place the unit on a level work surface and provide adequate room in front of the door for easy access, as well as the back for air ventilation.

❷

Plug the female end of the power cord into the back of the oven.

❸

To turn on the main power supply, press the Power ON/OFF switch located on the right side of the control panel to the ON position.

❹

To adjust the temperature setting, press either the UP or DOWN arrow buttons located below the Temperature Control display to raise or lower the displayed value (degrees Celsius). This setting is adjustable from +10 °C over ambient up to 99.9 °C. See “Setting the temperature controls” (page 7) for more details.

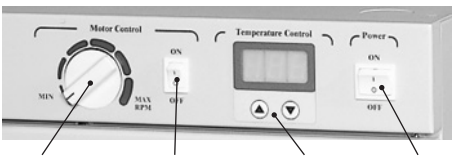
❺

To turn on the motor for the bottle holder carousel, press the Motor Control ON/OFF switch to the ON position.

❻

To adjust the bottle holder carousel to the desired RPM, turn the Motor Control knob clockwise to increase the RPM and counterclockwise to decrease the RPM.

Minimum RPM = OFF/10 Maximum RPM = 18



RPM Control Motor ON/OFF Temp setting Main ON/OFF

Setting the temperature controls

Whenever power is applied to the controller, the software revision number is displayed for several seconds. While the software revision number is being displayed, the intensity of the display digits alternates between full and half brightness, and on some models the two outside decimals points blink on and off. After several seconds, the displayed value reverts to the set temperature. In this mode, at most a single decimal point is illuminated, and the display intensity is steady.

Changing the setpoint

The current setpoint value can be altered using the UP and DOWN buttons while the setpoint is being displayed. To change the setpoint from normal mode, proceed as follows:

❶

Momentarily press then release either the UP or the DOWN button. The LED intensity will flash to indicate that the displayed value is the current setpoint.

❷

Increase or decrease the setpoint value by pressing the UP or DOWN button respectively. If either button is held down for more than several seconds, the setpoint value will increase or decrease continuously.

❸

When the desired setpoint is reached, wait approximately five seconds without pressing either button; the display will revert to normal mode showing the actual temperature.

The new setpoint becomes effective and is stored in the non-volatile memory when the display reverts to the normal mode.

IMPORTANT! Request a copy of the Hoefer, Inc. "Health and Safety Declaration" form before returning the item. No items can be accepted for servicing or return unless this form is properly completed. If radioactive or biohazardous material has been present within the unit, radioactive decontamination and biohazardous clean-up as per current Federal, State, and Local Guidelines and Biological Protocols must be performed BEFORE returning the unit.

Calibrating the temperature reading

The hybridizer is calibrated at the factory. Hoefer, Inc. recommends temperature recalibration be performed at the factory as recalibration by the user may void the warranty. Obtain a RA (Return Authorization) number from Hoefer, Inc. prior to returning a unit to the factory.

Decontamination

Bottles and caps

- Soak items in a diluted detergent solution overnight.*
- Remove items from detergent and rinse with distilled water.*
- If items are still contaminated, gently scrub with an abrasive cloth or brush. If necessary, continue to soak items in the detergent solution for a longer period of time.*

Oven chamber

- The oven chamber and drip pans may be decontaminated by wiping clean with a decontaminating agent, then repeat with distilled water.*

* These decontamination methods may not remove all contaminants. Refer to Federal, State, and Local Guidelines and Biological Protocols to assure decontamination.

Bottle care

Hybridization bottles are made of lead-free borosilicate glass, which provides excellent long-term reliability. Each bottle includes a polypropylene cap and Teflon® seal.

- It is important to check your bottles regularly for chips, stress fractures and cracks. If these occur, the bottle must be discarded.
- Between use, store bottles either in a suitable rack or with caps attached. This will protect the bottle and seal.
- Wear protective gloves to protect your hands in the event of an accidental breakage.
- Never overtighten caps on bottles. Hand tightening is sufficient.
- If the cap is difficult to unscrew, NEVER ATTEMPT to force the bottle cap open. Allow the bottle to cool and retry. If the cap remains stuck, discard the bottle.
- Bottles should not be used at temperatures above 70 °C.

Care and maintenance

Caution! Always unplug unit from electrical supply before cleaning or drying the unit.

Cleaning

The units are built to provide you with trouble-free operation. To ensure correct operation:

- Wipe ANY water from inside and outside the unit with a soft cloth or sponge.
- Use soap and water with a soft cloth or sponge to clean the unit.
- Do not allow chemicals to remain on unit surfaces.
- Never clean unit with abrasive pads or cleaners.
- Never clean unit with acetone or chloroform.

Customer service information

IMPORTANT! Request a copy of the Hoefer, Inc. "Health and Safety Declaration" form before returning the item. No items can be accepted for servicing or return unless this form is properly completed.

Technical service and repair

Hoefer, Inc. offers complete technical support for all of our products. If you have any questions about how to use this product, or would like to arrange to repair it, please call or fax your local Hoefer, Inc. representative.

Check the Hoefer, Inc. website at www.hoeferinc.com for the distributor in your area. Or contact us directly at:

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E-mail: support@hoeferinc.com

Hybridization techniques

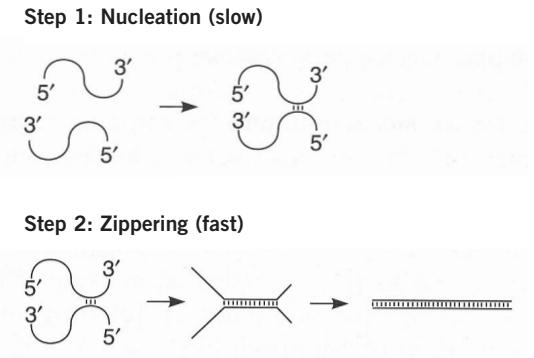
There are two main steps to a hybridization reaction: 1) hybridizing two strands of DNA carrying complementary sequences, and 2) detection of the hybridized DNA. Proximity of the DNA strands determines the frequency of the binding event and, therefore, success is dependent on the DNA concentrations.

Since the concentration of the target nucleic acid is usually unknown, it is an excess of labeled probe DNA that drives forward the hybridization reaction. This is simply increasing the chances of a probe encountering a target. But with an enormous amount of probe present (in solution or on the surface of a membrane) the background signal will also be enormous. The typical approach to correct for excess background on a membrane or slide hybridization is to wash in a low salt buffer as this favors the dissociation of unbound probe from the membrane/slide and from non-complementary DNA. In solutions, a probe can be enzymatically degraded by using a single-strand specific nuclease.

Mechanisms of nucleic hybridization

Hybridization occurs with a process called nucleation whereby the two separate nucleic acid strands come into close proximity of each other. A duplex region is formed where a minimum of three bases of one strand complements to those on the second strand. If the remainder of the strands are complementary, the two strands will anneal or zipper together very quickly (Fig 5). The rate-limiting step in nucleic acid hybridization is the duplex formation, which again explains why probe to target concentrations are critical.

Fig 5.



Experimental protocols

There are many different protocols available on the web, in journals, and in textbooks. We reference several at the end of this section.

1. Concentration of species

Target: The ideal quantity of target molecule depends on the complexity of the target nucleic acid. The amplified DNA, for example, may have been expressed in large or small amounts. Therefore, the trick is to start with sufficient target (~25 µg) and determine an ideal amount experimentally.

Probe: Plan to have more probe than expected target. To determine this, perform an extinction experiment: serially increase the amount of target by 2-fold against a fixed amount of probe. Hybridize for a short length of time and quantitate the amount of probe that has hybridized. As long as the signal increases and shows linearity there is excess probe present (Fig 6 left). If the signal levels off, then the probe is not present in excess (Fig 6 right).

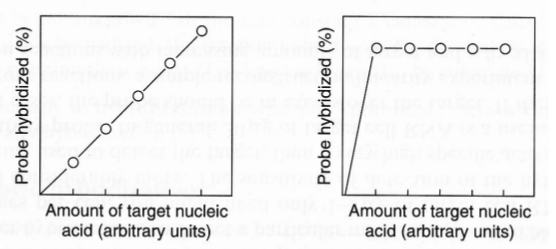

Probe hybridized (%)
Amount of target nucleic acid (arbitrary units)
Probe hybridized (%)
Amount of target nucleic acid (arbitrary units)

Fig 6. Analysis for probe excess in hybridization reactions.

2. Length of probe

The goal is to increase hybridization efficiency while minimizing background. The larger the probe, the more efficiently it binds target. The smaller the probe, however, an ever greater number of probe molecules is present per unit amount (ng). In most cases probes range from 20–1000 bps.

3. Salt concentration and temperature

Nucleic acid hybridization requires both salt (monovalent cations, such as Na^+), to counter the charge effects of the phosphate backbone, and heat, to provide non-denaturing kinetic energy that drives the slow nucleation step. Because the effects of each variable affect the other, knowing the thermostability of the hybrid probe-target is helpful. The hybridization rate varies directly with the sodium ion concentration between 0.03 and 1.2 M. Most protocols call for an environment between 0.5 and 1.1 M Na^+.

Situation	Response
G+C = 45–55%	Follow normal protocol.
G+C < 45%	Lower salt and temperature.
G+C > 55%	Raise salt and temperature.
Evidence of probe target mismatching.	Lower salt and temperature.
Target and probe are degraded in an aqueous environment.	Hybridize in a formamide-based buffer solution.
Unacceptable high background.	Use less probe. Hybridize at lower salt/higher temperature. Wash with lower salt/higher temperature. Incubate with very low salt; change nuclease (solution). Use a smaller probe or a different probe. Clean probe of contaminants prior to use.

4. Aqueous or denaturing hybridization buffer

If hybridization takes place in an aqueous salt environment of 0.8 to 1.2 M salt, the $T_{m½}$ (the temperature at which half of the duplex molecules will dissociate under a given set of conditions) can be 90 °C. This is high enough to degrade DNA, RNA and some proteins. It may be necessary to add formamide as a denaturing/temperature lowering agent. For every percent of formamide added to the reaction the $T_{m½}$ is reduced by 0.65 °C. Therefore, at 80% formamide, reactions can be performed in the 40–55 °C range. On the other hand, the presence of formamide requires longer incubations, since the rate of formamide-based hybridization is at least three-fold lower than that of aqueous hybridization.

Protocol

❶

Random priming method for tagging DNA with fluorescein-labeled nucleotide or other labeled nucleotides

This method uses DNA polymerase to incorporate fluorescein-11-dUTP into double-stranded DNA probes. This protocol can also be used to incorporate any tagged nucleotides.

Equipment

- Micropipettes and tips
- Microcentrifuge
- 1.5 mL microcentrifuge tubes
- Cap lock for microcentrifuge tube
- Boiling water bath
- Water bath set to 37 °C

Reagents

- Deionized, sterile water
- EDTA, 0.5 M
- DNA polymerase, Klenow fragment, 4–5 units/µL
- Nucleotide mix (300 µM each of dATP, dCTP, dGTP and 60 µM dTTP)
- Random nonamer (9-mer) primers, 2.5 µg/µL in water
- Reaction buffer, 10X (50 mM $MgCl_2$, 10 mM 2-mercaptoethanol, 500 mM Tris-HCl, pH 7.5)
- Tagged nucleotide: fluorescein-11-dUTP
- Template DNA in water (5 ng/mL)

Procedure

1. Pipette 10 µL of template DNA plus 10 µL of water into a microcentrifuge tube and cap tightly. Secure cap with a cap lock or use a bent paper-clip to ensure that the cap does not pop when the contents are boiled.
2. Place the tube into the boiling water bath for 5 minutes.
3. Immediately place tube on ice for 5 minutes.
4. Centrifuge for 15 seconds in microcentrifuge.
5. Add the reagents listed below to a fresh tube on ice in the following order:
   a. 10 µL Nucleotide mix
   b. 5 µL Tagged nucleotide
   c. 5 µL Reaction buffer (10X)
   d. 5 µL Random primers
   e. 10 µL Boiled DNA
   f. 14 µL Water
   g. 1 µL DNA polymerase, Klenow fragment
6. Mix gently and incubate at 37 °C for 1 hour.
7. Stop the reaction by adding 2 µL EDTA.
8. Store probes at -20 °C in the dark.

Protocol

❷

Hybridization to Nylon or Nitrocellulose

Hybridization of probe to target nucleic acid that has been previously transferred to nylon or nitrocellulose membranes is accomplished by adding single-stranded probe to the membranes that have first been incubated with prehybridization solution. Both the prehybridization and hybridization solutions contain buffers designed to prevent adventitious binding of the probe to the filters.

Reagents and equipment

- Prehybridization/hybridization solution [45% formamide, 5X SSPE (0.9 M NaCl, 50 mM sodium phosphate buffer, pH 7.4, 5 mM EDTA), 0.1% SDS, 5X Denhardt's solution (0.1% each of Ficoll, polyvinylpyrrolidone, and bovine serum albumin), and 100 mg/mL of denatured salmon sperm DNA]. Mix well and remove aggregates before use.
- Hoefer hybridization bottle(s) and caps
- 15 mL plastic tube
- Boiling water bath
- Bucket of ice
- Gloves
- Beta blocking shield
- Hoefer HB1000 Hybridization Oven

Note: When preparing prehybridization/hybridization solutions, add dry reagents directly to the formamide/SSC solution. Incubate with mixing at 40–50 °C for 2 hours or until dissolved. Store at -20 °C. SDS will precipitate at room temperature but remain in solution at 37 °C.

Procedure

1. Add 15 mL of prehybridization solution to each hybridization bottle containing the blot. Remove bubbles between the glass and blot. Cap the bottles, attach the bottles to the wheels of the bottle holder carousel, and close the hybridization oven door.
2. Incubate the blot at 42 °C for 1 hour.
3. Remove the prehybridization solution and replace with 10 mL of hybridization solution.
4. If using radiolabeled probes work safely from the other side of a beta-blocking shield. Pipette 1×10^6 counts per minute of radiolabeled probe, or 200 ng of biotinylated probe, into a 15 ml plastic tube. Seal the tube with a plastic cap and poke a hole in the top with a syringe needle to prevent pressure build-up during boiling.
5. Denature the probe by placing the samples in the boiling water bath and heating for 10 minutes. Immediately transfer the tube to ice for 5 minutes (to prevent renaturation). Add 5 mL of hybridization buffer to the probe and transfer to the hybridization bottle containing the blot. AVOID pouring the probe directly onto the blot.
6. Incubate in the Hoefer HB1000 Hybridization Oven for 6 to 8 hours at 42 to 56 °C.

Washing the blot

- Tupperware container (sized to contain the blot)
- 0.1X SSC, 0.1% SDS (pre-warmed to 50 °C)
- 2X SSC, 0.1 % SDS (room temperature)
- 2X SSC (room temperature)
- 0.15X SSC, 0.1% SDS (pre-warmed to 50 °C)
- Gloves
- Filter paper
- Cardboard
- Plastic wrap
- Tape

For radioactive probes, you will also need:

- X-ray film holder
- X-ray film
- Intensifying screen

Non radioactive probes

1. Wash blots in 2X SSC, 0.1% SDS for 3 minutes at room temperature (repeat one).
2. Wash filter in 0.15X SSC, 0.1% SDS for 15 minutes at 50 °C (repeat once).
3. Store blots in 2X SSC at room temperature.

Radioactive probes

1. Remove blot from hybridization bottle and transfer to Tupperware container.
2. Rinse briefly in 50 °C 0.1X SSC, 0.1% SDS.
3. Remove this solution and discard in radioactive waste.
4. Wash blot three more times in the same solution.
5. After the final wash, dry the blot on filter paper for 10 minutes. This is a good time to quickly pass your hand held radioisotope reader (beta or gamma counter) over your blot to get a general idea as to the exposure time you will need for the X-ray film. Hot blots can be placed against film for 20 minutes to 2 hours. Otherwise, exposure can continue overnight (8 hours).
6. Tape the blot to a cardboard backing.
7. Cover with plastic wrap to prevent the blots from sticking to the X-ray film.
8. Place the cardboard containing the blots into the X-ray film folder.
9. In the darkroom, place a sheet of X-ray film over the blot(s).
10. Place an intensifying screen on top of the film.
11. Close the film holder and clamp it.
12. Store at -70 °C. The low temperature reduces light scattering and increases the length of exposure time. Expose the blot for 20 minutes to 24 hours.

Protocol

❸

Chemiluminescence detection: HRP-tagged, alkaline phosphatase (AP) probes or antibody conjugates

Equipment

- Clear plastic cling-wrap or clear transparent sheet protector.
- Hoefer ULTima Pro imaging system with cooled CCD camera.
- Pipette

Reagents (Chemiluminescence)

- ECL™ (or other) detection reagent 1
- ECL (or other if required) detection reagent 2
- Membrane following hybridization

Procedure

1. Mix equal volumes of detection reagents 1 and 2.
2. Pipette the mixture over the surface of the membrane and leave at room temperature for 1 minute.
3. Follow the wash instructions provided by the kit manufacturer. Remove the final wash and cover the membrane in plastic wrap.
4. Image using the Hoefer ULTima Pro chemiluminescence imaging system.

References

Ross, J (1998). *Nucleic Acid Hybridization: Essential Techniques.* John Wiley and Sons, ISBN 0-471-97125-1.

Sambrook, J (2001). *Molecular Cloning: A Laboratory Manual* (Third Edition). Cold Spring Harbor Laboratory Press, ISBN 0-87969-577-3.

Current Protocols in Molecular Biology (1987). John Wiley and Sons; ISBN 0-471-50338-X.

Ordering information

product	quantity	code number
HB1000 Hybridization Oven 115 VAC, 60 Hz	1	HB1000-115V
HB1000 Hybridization Oven 230 VAC, 50 Hz	1	HB1000-230V
Bottle, small, 35 × 150 mm Includes: Borosilicate glass bottles with polypropylene cap and Teflon seal.	1	HB1110X
Bottle, large, 35 × 300 mm Includes: Borosilicate glass bottles with polypropylene cap and Teflon seal.	1	HB1111X
Rocker plate	1	HB1140X
Drip trays	2	HB1141X
Carousel kit, for small or large bottles	1	HB1109X
Adjustable feet	4	HB1150X
Power cord, 115 V	1	PSCORD-115V
Power cord, 230 V, Euro Plug Schuko	1	PSCORD-230V
Fuses, 10 amp, 250 V, 3AG, SB, Cer	5	PSF10A-SB-3AG

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